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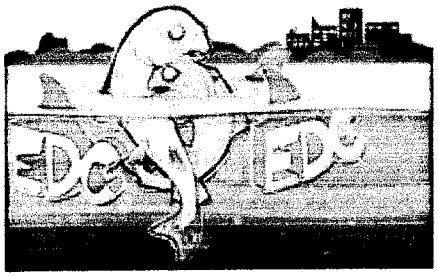
A Fish Problem This Big

Scientists, policymakers debate growing EDC pollution in Idaho waters

By Peter Wollheim

Whenever offered a glass of water, the great comedian W.C. Fields typically declined, on the grounds that fish have sex in it. But with the increasing spread of a class of chemicals called endocrine disruptor compounds (EDCs) in Idaho's watersheds, some experts wonder if local fish are at risk of losing their sexual and reproductive capacities.



Ben Wilson

Despite scarce funding, the ramifications for human health still prompt research in this area.

The potential hazards of EDCs were first discovered in the 1990s among fish and amphibians that gather downstream from sewage treatment plants in Europe. These waters contain abnormally high concentrations of organic chemicals such as steroids, nonprescription drugs, insect repellents, detergents, plasticizers, fire retardants, antibiotics, fragrances and household solvents and their byproducts. Aquatic biologists noticed that wild fish and frogs evidenced significantly increased rates of sex reversal, gonadal cysts and other reproductive tract tumors, dead tissue and decreased fertility. Intersexed or feminized fish, in which males grow both functioning testes and ovaries, have already been caught in rivers in Colorado, Washington state and Virginia, and in Lake Ontario. Because these intersexed characteristics make reproduction difficult, they tend to appear just before fish populations begin to decline.

EDCs are found in herbicides and pesticides, plastics, pharmaceuticals, residues from contraceptives and hormone replacements, cleansers, human waste and pollution from feedlots.

The latter are especially controversial. In 2006, residents in Weiser raised questions about possible contamination of their domestic water supply from hormones and antibiotics used by nearby Sunnyside Feedlots (BW, *News, "Dirty Water," February 1, 2006*). According to state officials, the Idaho Department of Health and Welfare expects to have the results of its study available for public comment in February.

Now, scientists have evidence that some of these EDCs, called xenoestrogens, might cause conditions such as testicular cancer, urinary tract birth defects, low sperm counts and the premature onset of menses in females among people who regularly drink water with these compounds in them.

Kai Elgethun, Ph.D., Idaho's state toxicologist, says the majority of xenoestrogens come from everyday personal-care products such as soaps, lotions, medications and cosmetics. While xenoestrogens are far less potent than estrogens proper, Elgethun says, they can accumulate in body fat and stay in the system a long

time.

DDT is one of the most familiar xenoestrogens, but 2,4-D, the most commonly used herbicide in the U.S., and 2,4,5-T, used in Agent Orange, have also been in the news. Dioxins, the byproducts of burning plastics and rubber, are among the most hazardous xenoestrogens.

Researchers worry that policymakers are ignoring the hazards of this little-known pollution.

Jim Nagler Ph.D., an associate professor of biology at Idaho State University, operates a lab that examines the effects of environmental estrogens on fish fertility. He thinks that the issue of EDC leakage or dumpage into state waters should be a priority.

"In terms of what's actually out there, we have no clue, we have no baseline at this point," Nagler says. "What's in the Snake River? What's in the Clearwater River? Who knows?"

Papers written by Nagler and research associates about estrogens and other EDCs suggest that rainbow trout are susceptible to even short-term exposure to the chemicals.

Don Essig, administrator for water quality of the Idaho Department of Environmental Quality (DEQ), acknowledges that it's an emerging issue.

"[It's] probably something we should be paying attention to, but you can't have too many No. 1 priorities," Essig says.

Instead, Essig says, DEQ concentrates on biological examinations of water, not necessarily a lot of chemical analysis. "I'm sure we're going to be hearing about it more in the emerging future, [but] there's a zillion things out there that we just don't have the budget to study."

Given Idaho's relatively low population density, Essig surmises that Idaho is "probably better off" than more urban states. He attributes much of the contamination to household products such as over-the-counter medications, chemicals, antibacterial soaps and so on.

"The sewage techniques of the day don't treat those things, so they just pass on through," he says.

Essig's outlook differs from that of Boise City's water quality manager, Robin Finch.

"The dirty little secret in all this is that almost 90 percent of all pharmaceuticals manufactured in this country are made for agricultural use, and they're disposed of inside a watershed," Finch says. The issue crosses both municipal and agricultural lines, and demands some level of partnership.

"We need to partner with those guys for the sake of public protection," she says.

Local officials have been tracking the EDC issue since the European studies, but there are "a lot of questions that still need to be resolved before we can launch on this," Finch says.

Although a nationwide study by the U.S. Geological Survey included three Boise River sampling sites, Finch says the matter is "still a very researchy topic at this point."

"There's no standards, no monitoring requirements, no good understanding of threshold effects at either

ecological or human health levels," Finch says. "We can identify about 60 to 70 compounds right now that have estrogenic effects, but there's potentially 10,000 out there."

While the USGS study found few target compounds at relatively low or medium concentrations, Finch says that the city is already looking at Seattle's "Flush No Drugs" campaign, which encourages residents to bring their outdated prescription drugs to fire stations for proper disposal, instead of flushing them down the toilet.

The USGS study's one-time reconnaissance of waste compounds in the lower Boise found several endocrine disruptors present, says Mark A. Hardy of the USGS.

The agency also looked for those compounds at several groundwater wells throughout Idaho.

Yet in an e-mail to Trout Unlimited (a trout and salmon conservation organization), forwarded to *BW*, Hardy does not comment on the data or their environmental and human health implications.

Carl Ellsworth, environmental manager of the Boise City Public Works Department, confirms that his department is aware of the EDC issue.

"It's definitely on the radar screen, and it's a pretty high-powered discussion; but our staff follow it, and we've had our consultants look at it," he says.

While there are "no standards yet, and the jury is still out, it's an issue we need to be on top of," Ellsworth says.

But he was reluctant to estimate what it might cost the city to start EDC monitoring because there are "a lot of unknowns and we don't have the answers yet."

The city currently examines its water supply and waste "for metals, phosphorus, fecal coliform, solids, volatile organics--but not on a routine basis," he says. The city relies on subcontractors to do the work.

Local conservation groups have not yet gotten active in this area.

Bert Bowler, native fisheries director for Idaho Rivers United, says that "it's relatively new ... I'm not aware of anything in Idaho going on about it."

Pam Smolzynski of Trout Unlimited agrees.

"This is a little bit cutting-edge for us," says Smolzynski. "People here know about it, but we don't actually track water quality." Much of Trout Unlimited's work focuses instead on watershed and fish habitat restoration. But Jack Williams, a senior scientist for Trout Unlimited, says in an e-mail that his organization has been "asking EPA about what they are doing with endocrine disrupting chemicals, but can't get a reply from them."

For now, state toxicologist Elgethun says that Idaho does not have any particular source of xenoestrogens that is different from other states or greater than other states.

"A greater long-term concern for waters nationwide are estrogens proper, which are present in discharge from most water treatment plants and can be present in discharge from [feed lots]," Elgethun says. There are no EPA standards for estrogens, but there are national drinking water standards for the majority of

xenoestrogens.

"This discrepancy is a pressing concern for EPA," says Elgethun.

Whether Idaho's pollution concentrations or sources are different, the Gem State does have extra reason for caution, according to Jim Werntz, director of the Environmental Protection Agency Idaho Operations Office.

"Ninety-five percent of people in Idaho drink groundwater, which is the highest percentage in the nation," Werntz says.

While noting that EDCs are often associated with veterinary drugs from feedlots, Werntz says most of his agency's research deals with surface water and contamination from nitrates.

"There's not enough scientific basis right now for understanding hazards or setting minimum standards of water quality in regards to EDCs," Werntz says.

While standards remain unset, Idahoans continue to drink water and eat fish containing the chemicals.

The public policy implications of endocrine disruptors go even further than that, according to Conrad Volz, a national expert in the field. Volz serves as scientific director for the Center for Healthy Environments and Communities, and is the co-director of the Exposure Assessment and Control Division at the University of Pittsburgh Cancer Institute's Center for Environmental Oncology.

"[Endocrine disruptors] are very important, but remember the wide range of chemicals in everyday use," Volz says in a telephone interview with *BW*. "Whatever we flush down the toilet we wind up drinking, or ends up in the animals that humans are going to be eating. All these chemicals go into our waterways and are not entirely filtered out from the water supply."

Volz's own lab research suggests direct associations between exposure to such chemicals through eating fish flesh and fat. That leads to an increased potential risk for cancer of any tissue that is responsive to estrogen, potentially leading to ovarian, uterine and breast cancer, and potentially some effects on the prostate. All this has far-reaching implications, says Volz, "but what they'd mean is hard to say."

Volz's interest in fish and other species--what he call "bioindicators"--stems from a much wider concern with human health.

"Public health-wise, our biggest problem in the 21st century is water, what's in it, its overuse and nearby land development," Volz says. "In fact, water management policy is a national and even international security policy. Water is it."

Volz, who advises NATO on peace and security issues, believes that as pure water becomes a scarcer commodity, states should be designating restricted watersheds for strategic reasons.

"We need to be very careful because you cannot divorce the issue of chemicals going into our waterways from land development," says Volz. For example, the kinds of herbicides, pesticides and turf-topping compounds used in new subdivisions contain carcinogens that nonabsorbent pavement shunts away into culverts. Development distribution patterns also require rethinking.

"If we continue to break up our watersheds, we continue to degrade the ability of natural ecosystems to

purify our water. There's bacteria that live in topsoil that can help break down these chemicals, but when you develop for thin layers of topsoil, a monoculture of grass instead of native species, and don't allow for larger trees, you reduce the ability of that area to hold and purify water."

Until zoning and development policies change, Volz urges people to consider how they use and discard everyday cosmetics, pharmaceuticals, disinfectants and antibacterial soaps, cosmetics, garden chemicals, batteries and objects containing heavy metals such as cadmium.

And it only gets more complicated as society's needs and tastes change. In the midst of all this, the Associated Press reported on December 26 that University of Washington scientists had detected elevated levels of caffeine, cinnamon, vanilla and artificial vanilla some 640 feet below the surface of Puget Sound.

Some researchers speculate that these substances, so essential to Seattle's most famous commercial product, may interfere with the ability of fish to detect food sources and egg-laying sites. Fisheries biologists point out that the findings demonstrate the migration and dispersion of organic substances via sewage systems.

"This is not just an ecological problem, but a human health problem," Volz says. "People need to realize that we are part of this chain, and that what goes down the drains comes back to us."

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